REMARKS

The rejections of Claims 12 and 18 under 35 U.S.C. § 102(b) as anticipated by U.S. 6,011,307 (Jiang et al); and under 35 U.S.C. § 103(a) of Claims 19-23 and 31-35 over Jiang et al in view of U.S. 6,180,226 (McArdle et al), and of Claims 24-26, 30, 36-38, and 47 as unpatentable over Jiang et al in view of U.S. 6,103,359 (Doi), are respectfully traversed. Jiang et al disclose a method comprising the steps of: sheeting a composite sheet comprising ferromagnetic particles dispersed within a matrix material, applying a magnetic field to the composite sheet in the direction of the thickness of the composite sheet so as to align the ferromagnetic particles within the matrix material and if necessary, partially curing or otherwise hardening the sheet (column 5, line 45 through column 6, line 2). Jiang et al disclose that their adhesive material is fully cured (for thermoset-type resins), baked (for thermoplastic-type resins), or otherwise hardened to completely set the adhesive material (column 3, lines 62-65), and thus, Jiang et al disclose only either thermoset-type resins or thermoplastic-type resins for their matrix material (column 9, lines 41-48).

Present Claim 12 recites a process for producing a composite sheet in semi-cured form, comprising the steps of sheeting a composition for composite sheet into a sheet of given thickness, said composition comprising a magnetic fibrous filler (A) and a binder (B), said binder (B) comprising **a photocuring component and a thermosetting component**, and not only applying a magnetic field to the composition sheet in the direction of the thickness of the composition sheet so as to orientate the magnetic fibrous filler (A) in the direction of the thickness of the composition sheet but also curing the **photocuring component of the sheeted composition**, thereby obtaining a **semi-cured** composite sheet (emphasis added).

Thus, the invention of Claim 12 employs a mixture of a photocuring component and a thermosetting component, wherein the photocuring component is cured, thereby obtaining a semi-cured composite sheet. Jiang et al, on the other hand, and as discussed above, disclose the use of only either a thermoset material or a thermoplastic material. Thus, Jiang et al neither disclose nor suggest the combination of a photocuring component and a thermosetting component.

The advantage of the presently-claimed invention, which involves the formation of a semi-cured composite sheet, is that since an uncured thermosetting component is contained therein, a magnetic fibrous filler is easily orientated in the direction of thickness of the semi-cured composite sheet. Therefore, the composite sheet having been cured by thermocompression of the semi-cured composite sheet is excellent in its ability to bond electrode parts and a circuit substrate. Furthermore, the thickness of the anisotropic conductive sheet can be increased while maintaining low resistance, so that not only can mathematical dispersion of electrode height be absorbed but also straining of the anisotropic conductive sheet can be inhibited. Additionally, the anisotropic conductive sheet is excellent in heat resistance, durability and mechanical strength. A contact structure wherein this anisotropic conductive sheet is employed is satisfactory for connection of electrode parts of a semiconductor element or the like to wiring parts of a circuit substrate, enables easy performance of reliable electrical connection, and exhibits high electric conductivity in the direction of the thickness of the sheet. Still further, the anisotropic conductive sheet, also capable of conducting heat, can be obtained by employing a fibrous filler having high thermal conductivity in a direction of fiber length.

The partial curing in Jiang et al is merely the thermoset material therein not being hardened entirely which, as discussed above is different from the presently-claimed

invention, nor are the above benefits of the presently-claimed invention disclosed or suggested by Jiang et al.

Present Claim 18 recites a process for producing a composite sheet, comprising the steps of interposing a sheeted composition of given thickness comprising a magnetic fibrous filler (A) and **a thermosetting and/or photocuring binder** (B) between a pair of magnetic pole plates each having on its **surface projected magnetic pole surface portions**, and not only applying a magnetic field parallel to the direction of the thickness of the sheet to the sheeted composition so that the magnetic fibrous fillers (A), while being orientated in the direction of the thickness of the sheet, **are bundled in the vicinity of projected magnetic pole surface portions of the magnetic pole plates** but also curing the binder (B) by heating and/or light irradiation (emphasis added).

Thus, and as shown in Fig. B-3 herein, the magnetic fibrous fillers, while being orientated in the direction of the thickness of the sheet, are bundled in the vicinity of projected magnetic pole surface portions of the magnetic pole plates, resulting in a structure as shown in FIG. B-1 herein.

The invention of above-recited Claim 18 is clearly distinguishable from Jiang et al with regard to the orientation and bundle of the magnetic fibrous filler. Jiang et al neither discloses nor suggests applying a magnetic field parallel to the direction of the thickness of the sheet to the sheeted composition so that the magnetic fibrous fillers, while being orientated in the direction of the thickness of the sheet, are bundled in the vicinity of projected magnetic pole surface portions of the magnetic pole plates. Indeed, Jiang et al do not disclose particular magnetic pole plates as used in the present invention. Compare with magnetic poles 130 and 132 in Fig. 7, and the disclosure in the sentence bridging columns 5 and 6, of Jiang et al. The advantage of the structure recited in Claim 18 is that, for example,

when the fibrous filler has high electric conductivity, there can be provided an anisotropic conductive composite sheet wherein electrically conductive parts are formed at given positions, the density of electrically conductive parts can be increased, and the electrically conductive parts have low resistance and exhibit high anisotropic conductivity in the thickness direction, and which is excellent in heat resistance, durability, mechanical strength and adherence to semiconductor elements. Further, a heat-conductive composite sheet can be obtained by a similar process.

Neither McArdle et al nor Doi remedy the above-discussed defects of Jiang et al. Regarding McArdle et al, it neither discloses nor suggests any of the above-emphasized limitations of Claims 12 or 18. McArdle et al merely describe the formation of a monolayer of particles which are obtained by coating a nonmagnetic, nonconductive core with electrically conductive metal. Doi discloses a plurality of projections arranged in the form of stripes or islands on the surface of a magnetic pole; concave portions are filled with nonmagnetic material on the surface of magnetic plates so that the surface of the magnetic pole plates are planar. However, Doi neither discloses nor suggests the use of a magnetic fibrous filler or a composite sheet containing a semi-cured binder comprising a thermosetting component and a component resulting from curing a photocuring component, together with magnetic fibrous filler.

For all the above reasons, it is respectfully requested that the rejections over Jiang et al alone or in view of McArdle et al or Doi, be withdrawn.

The rejection of Claim 13 under 35 U.S.C. § 102(e) as anticipated by U.S. 2002/0056906 (Kajiwara et al), is respectfully traversed. The Examiner relies on paragraph 15 of Kajiwara et al, which discloses:

> In addition, according to the present invention, there is provided a method wherein projection bumps, made of precious

> metal, each of which has a projection type shape are respectively formed on electrodes of a semiconductor chip; precious metal is formed on the surfaces of internal connection terminals of a printed circuit board; a thermosetting resin sheet which has been semi-cured by mixing therewith fine inorganic fillers is attached to a predetermined position of the printed circuit board; the printed circuit board is set on a heat stage; the chip is mounted thereto in a face down manner with the bumps and the internal connection terminals aligned with each other; a heated joining tool for applying the ultrasonic wave and the load is pressed against the chip from the upper side by a predetermined force; and after the precious metal bumps have been buried in the resin sheet, which was softened by the heating, to come into contact with the connection pads, respectively, the precious metal bumps are crushed to be metallically joined to the pads, respectively, while pushing out a part of the resin sheet from the part between the chip and the board to the outside by applying thereto the ultrasonic wave vibration.

Present Claim 13 recites a method of using a composite sheet, said composite sheet being one of given thickness in semi-cured form comprising a semi-cured binder (B1) and, incorporated therein, a magnetic fibrous filler (A), **said semi-cured binder (B1) comprising a thermosetting component and a component resulting from curing of a photocuring component**, said magnetic fibrous filler (A) orientated in the direction of the thickness of the semi-cured composite sheet, which method comprises the steps of interposing the semi-cured composite sheet between an electrode part of a semiconductor element or semiconductor package and a wiring part of a circuit substrate, and curing the thermosetting component of the semi-cured composite sheet to thereby convert the semi-cured composite sheet to a cured composite sheet so that the electrode part and the wiring part are electrically connected to each other (emphasis added).

Thus, in Claim 13, the invention includes using a semi-cured binder comprising a thermosetting component and a component resulting from curing of a photocuring component. Moreover, after interposing the sheet, the thermosetting component of the semi-

cured composite sheet is converted to a **cured composite** sheet so that the electrode part and the wiring part are electrically connected to each other.

As paragraph 15 in Kajiwara et al indicates, ultrasonic wave vibration is applied, not a magnetic field as required by the present invention. Nor does Kajiwara et al disclose or suggest the use of a magnetic fibrous filler. Indeed, the composite sheet of Claim 13 is clearly different from that of Kajiwara et al. In Kajiwara et al, a thermosetting resin sheet which has been semi-cured by mixing therewith fine inorganic fillers is attached to predetermined position of the printed circuit board and then heated. However, Kajiwara et al neither discloses nor suggests the combination of a photocuring component and a thermosetting component. Nor does Kajiwara et al disclose or suggest the above-discussed advantages and benefits of the present invention.

For all the above reasons, it is respectfully requested that the rejection over Kajiwara et al be withdrawn.

The rejection of Claim 56 under 35 U.S.C. § 112, second paragraph, is respectfully traversed. Indeed, it is now moot in view of the above-discussed amendment. Accordingly, it is respectfully requested that it be withdrawn.

The objection to Claim 56 is now moot in view of the above-discussed amendment. Accordingly, it is respectfully requested that it be withdrawn.

All of the presently pending and active claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

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HEREWITH

IN THE CLAIMS

--56. (Amended) A method of using a composite sheet, comprising electrically connecting an electrode of a semiconductor element and an electrode of a circuit substrate to each other through [each of the composite sheets of claims 49 to 55] a composite sheet comprising a magnetic fibrous filler (A) orientated in the direction of the thickness of the composite sheet, at least 80% of the magnetic fibrous filler (A) having a fiber length L_1 satisfying the relationship:

$$0.5 \times D < L_1 < (L_2^2 + D^2)^{1/2} \quad \text{(I)}$$

wherein L_1 represents a fiber length of magnetic fibrous filler (A), D represents a thickness of composite sheet, and L_2 represents a minimum distance between neighboring electrodes among neighboring-electrode distances with respect to electrodes arranged on a semiconductor element on its composite sheet side or neighboring-electrode distances with respect to electrodes arranged on a circuit substrate on its composite sheet side, and

wherein the magnetic fibrous filler (A) is a fibrous filler having both conductivity and magnetism.

57. (New).--